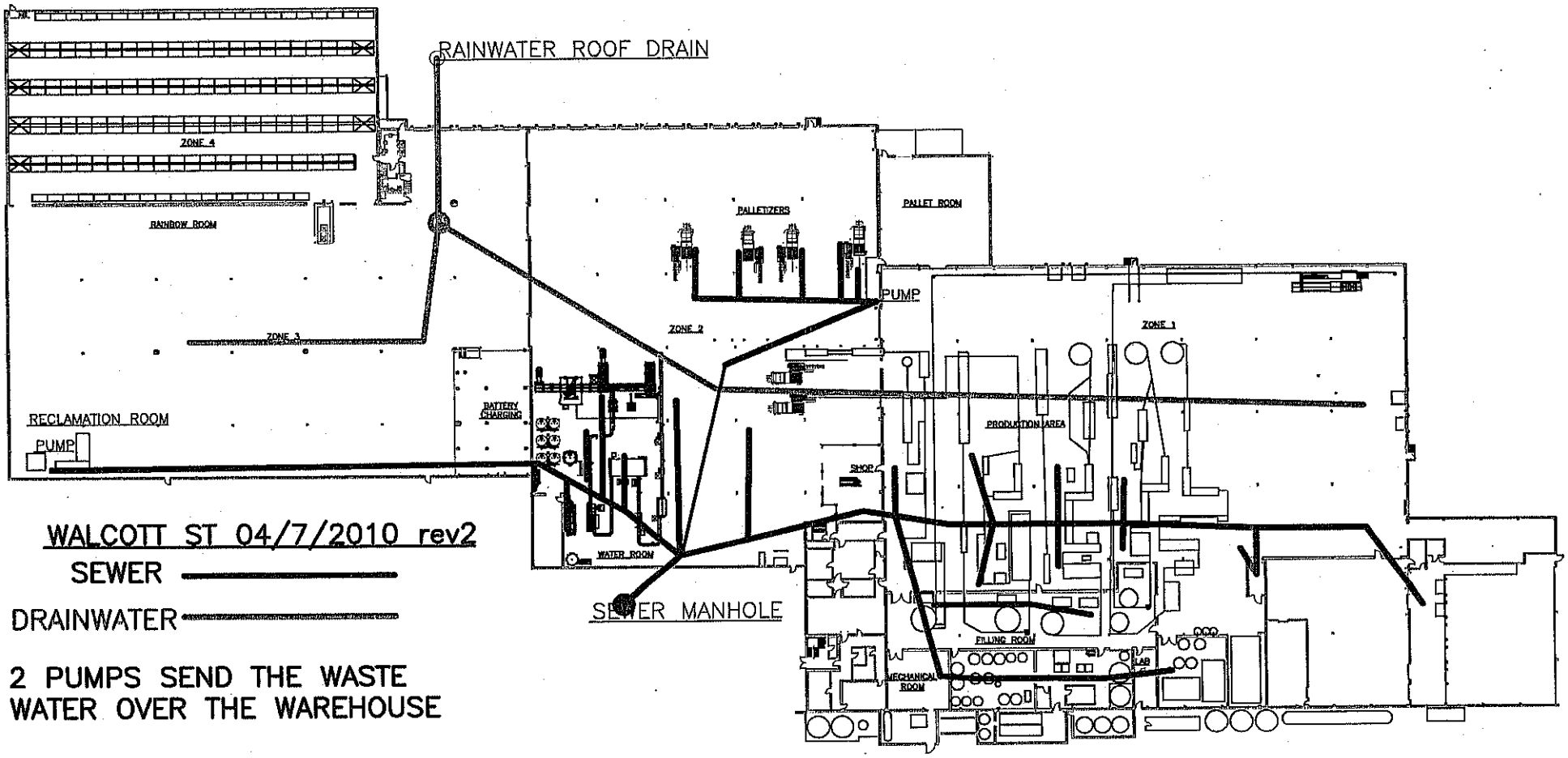
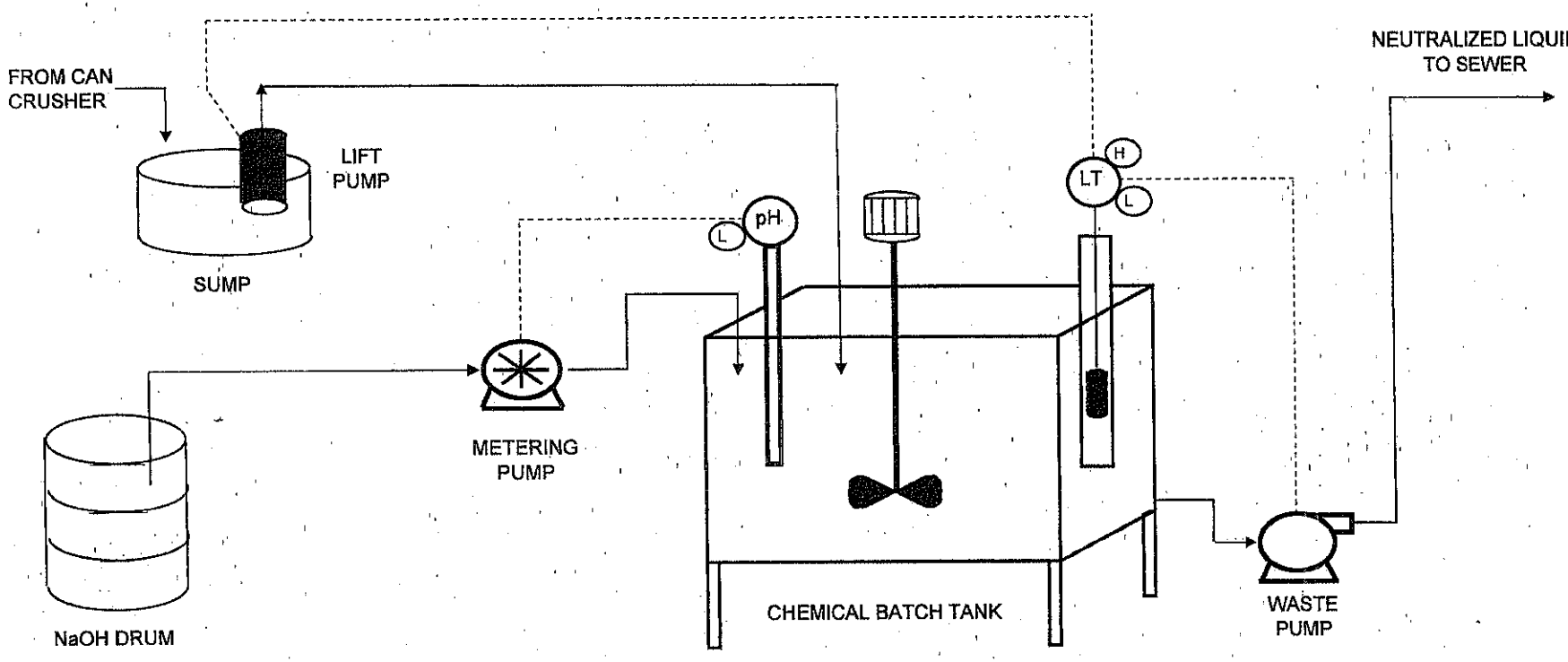
Attachment 1.



Attachment 2.

1.




--- POLAR BEVERAGES WASTE LIQUID NEUTRALIZATION SYSTEM ---

COMMONWEALTH OF MASSACHUSETTS
PETER
A.
MUNK
No. 31648
CHEMICAL
REGISTERED
PROFESSIONAL ENGINEER

Peter A Munk
12-17-09

| DRAWN BY: PAM |
| --- |
| DATE: 12-16-09 |

POLAR BEVERAGES
BATCH NEUTRALIZATION OF ACIDIC EFFLUENT

Each batch to be neutralized contains 95 gal of aqueous solution at pH = 4.5

$4.5 = - \log [H^+]$

Hydrogen concentration $[H^+] = 1 / 10^{4.5} = .000032$ mole/liter

Hydrogen quantity n = .00032 mole/liter x 360 gal x 3.8 liters/gal

= 0.0115 mole

Neutralization requires 0.0115 moles $OH^-$ = 0.0115 moles NaOH

$$\text{Required mass of NaOH} = \frac{0.0115 \text{ mole} \times 40 \text{ gm NaOH/mole}}{0.45 \text{ gm NaOH / gm solution}}$$

= 1.02 gm solution

NaOH metering pump delivers 70 cm3 / min = 1.17 cm3 / sec

$$\text{Required pumping time} = \frac{1.02 \text{ gm}}{1.05 \text{ gm/cm3} \times 1.17 \text{ cm3/sec}} = 0.9 \text{ sec}$$

Conclusion: Metering pump has ample capacity to neutralize the acidic effluent stream with rapid response time

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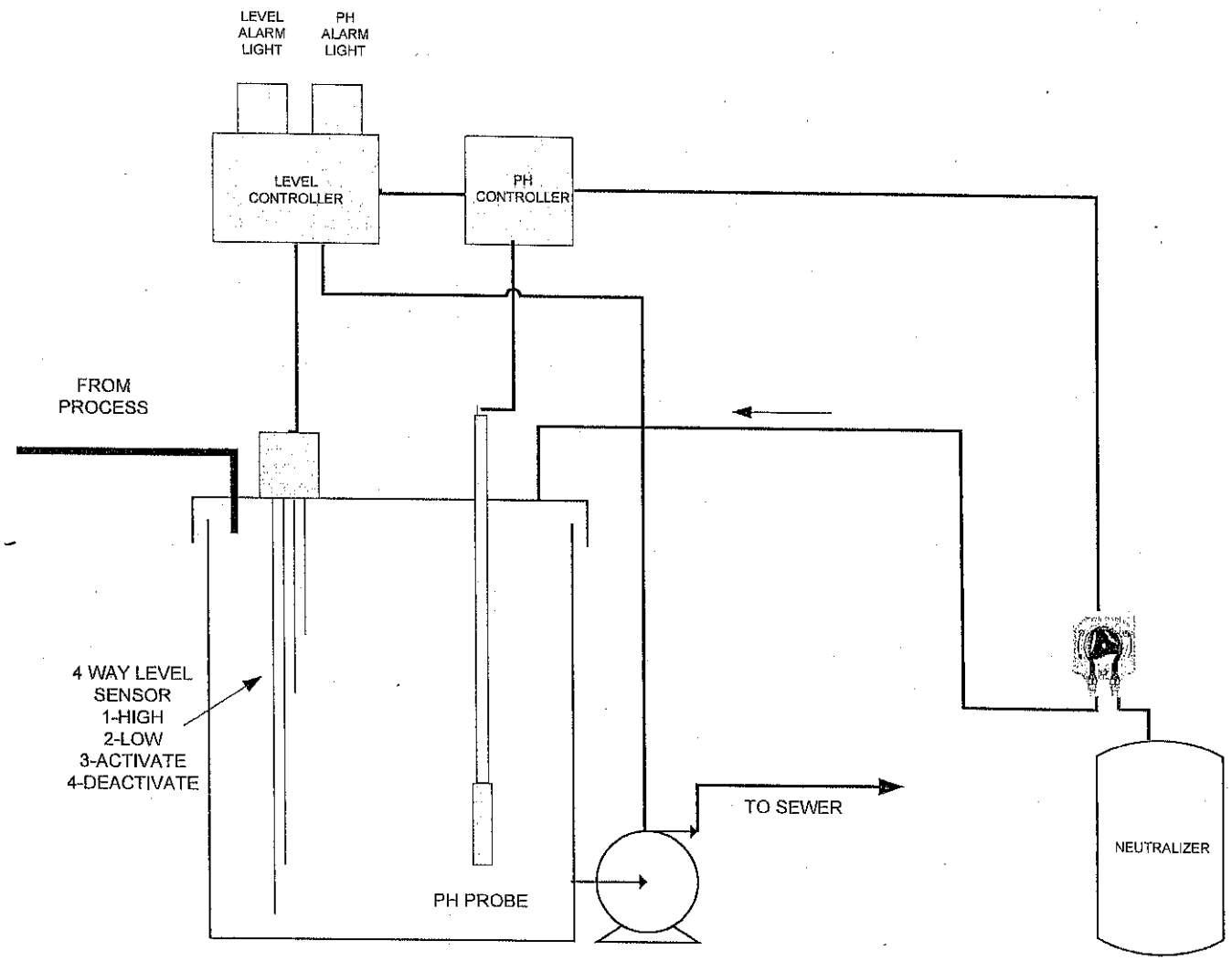
12-17-09

# POLAR BEVERAGE RECLAIM SYSTEM

Monday, January 11, 2010

Chemetall




T. Slezak/R. Bodak